Chemical Process Hazard Analysis
High Hazard Review Checklist
(See attached instructions)

Introduction

Every laboratory performing chemical processes should have a current hazard analysis. The Process Hazard Analysis (PHA) is mandatory for chemical processing laboratories to assess the hazards associated with new or modified chemical processes or operations. The High Hazard Review Checklist is used in evaluating the safety of new, modified, or relocated experiments or tests which present a high potential hazard to employees, equipment and facilities, or the environment. Laboratory Managers are responsible for completing the analysis. Participation by a representative of the Safety and Environmental Branch (Code 205.2) is required.

Instructions at the end of this template provide information on the hazard review process, and aid the Laboratory Manager in determining which level of Process Hazard Review is appropriate: Low, Moderate, or High. A High Hazard Review (HHR) is conducted for "high hazard" equipment, experiments, and processes, which, in the even of a failure, present a significant potential for injury, equipment damage, or environmental impact. An HHR requires a special review team to thoroughly analyze the potential hazards in the specific planned laboratory environment to identify process changes and hazard mitigation measures.

The responsible organization will establish a HHR Committee consisting of the Laboratory Manager (who will chair the committee), a representative of the Safety and Environmental Branch (S&EB), researcher, technician, Chemical Safety Committee (CSC) representative, and any other resources deemed necessary. The HHR Committee performs a comprehensive analysis of all potential hazards involved in the laboratory processes and equipment. A member of the CSC or an S&EB representative can help determine how best to accomplish the review, based on the nature of the hazard(s) presented.

This type of review requires a number of documents to be assembled and made available to the review committee. Piping and instrument diagrams, chemical reaction characteristics, safeguards and personal protective equipment, relevant incident reports, and operating and emergency procedures are all examples of what may be required. Other types may be identified by the review committee.

The review will be documented thoroughly. The completed review package, in combination with other required laboratory operating procedures, constitutes the laboratory safety documentation package, and is controlled in accordance with GPG 1410.2. This package must be available in a prominent location in the laboratory while the work is in progress.

Laboratory Identification

Laboratory Name/Description		
Laboratory Location		
Laboratory Manager	Code	Ext.
Product/Experiment Description		

The following steps make up the HHR, and are the responsibility of the Laboratory Manager.

☐ **1. Consult with assigned S&EB representative**
- a) Provide brief description of process and potential hazards
- b) S&EB may suggest review guidelines and potential HHR Review Committee participants

☐ **2. Assemble High Hazard Review Committee**
- a) Laboratory Manager (required), who will chair the HHR Committee
- b) Technical expert/researcher/lead engineer
- c) Safety and Environmental Branch Coordinator (required)
- d) Others (determine with S&EB Coordinator)
- e) CSC representative

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Previous versions are obsolete

☐ **3. Provide Process Information at least one week prior to review**

a) Process Chemistry - reaction rates, temperature, pressure, intermediates, etc.
b) Process Flow Diagram
c) Piping and Instrument Diagram
d) Equipment Specifications - capacity, pressure rating, etc.
e) Standard Operating Procedures (SOP's). A draft is acceptable, but it must be approved before the process is begun.
f) Environmental Information - permits, waste disposal, minimization
g) Emergency Plans - evacuation, fume release
h) Process History - *review any related previous incidents*
i) Personal Protective Equipment
j) Material Safety Data Sheets

☐ **4. Schedule Review**

a) Review meetings held near operating area
b) Have major components available for area inspection

☐ **5. Perform Review & maintain minutes of meetings.** Distribute to HHR Committee for review and comment

☐ **6. Issue Final Approval and Report**, containing the following:

a) Cover sheet, with configuration control information as specified in GPG 1410.2
b) This checklist, signed and dated, with a signed Hazard Analysis Selection matrix
c) Abstract (summary of study boundaries and techniques)
d) Introduction and objectives
e) Progress Report Format
f) Program/Process Description
g) Study Committee/Reviewers
h) Area Inspection and Review -- description and findings
i) Personnel -- names, qualifications, training
j) Consequence Analysis
k) Recommendations, responsibility and disposition of recommendations
l) Summary and conclusion
m) Sign-off by HHR Committee (with Safe to Operate Certification)
n) Reference Material
o) Attachments: supporting documentation, e.g., design criteria; Process and Instrument (P&I) Diagram; equipment specifications; decision trees; alarms and interlocks; pressure relief vent calculations; Environmental Permit; materials of construction, inspection reports; incident history, Material Safety data Sheets (MSDS)

☐ **7. Documentation and Records**

Upon completion of the review and issuance of a Safe to Operate Certification, process operators will be briefed on all safety procedures and concerns, and certify their understanding of requirements. All necessary safety information, including MSDSs and other safety references, will be prominently posted in the laboratory area. A dated copy of the report and all attachments will be provided to the S&EB representative. The record copy of the report will be retained by the Laboratory Manager.

Approved:

_____	_____	_____
Laboratory Manager Signature/Code	*Title*	*Date*
_____	_____	_____
Branch Head Signature/Code	*Title*	*Date*

General Instructions for Laboratory Process Hazard Analysis

Introduction

The identification and control of hazards in the laboratory is the responsibility of the owning organization. The Laboratory Process Hazard Analysis is designed to aid management in meeting this responsibility.

The Process Hazard Analysis (PHA) is mandatory for laboratories and other areas that use chemicals for other than normal housekeeping purposes. These analyses are used to assess the hazards associated with new or modified processes or operations in a laboratory environment. There are three levels of reviews for three anticipated levels of hazards: Low, Moderate, and High.

The Hazard Analysis Selection Matrix provides the Laboratory Manager a quick way to assess the level of process hazard analysis required. The matrix has three vertical columns that correspond to the three levels of review. Horizontal lines describe various potential hazards. By checking those that apply in the appropriate columns, the necessary review level becomes easier to define.

Approach

The first step in determining the level of review required is to fill out the **HAZARD ANALYSIS SELECTION MATRIX** on the last page of these instructions. There are four major sections to the matrix: Material Hazards, Processing Hazards, Equipment Hazards, and Environmental Hazards. Various criteria within these categories determine the level of hazard analysis required.

These guidelines are the MINIMUM suggested methods, and are not meant to be a substitute for good judgment. Combinations of lower level hazards may indicate a need for a higher level of review. Conversely, if in your judgment you can use a lower level of hazard review than that indicated by these guidelines, you may do so with the approval of the Laboratory Manager and Division Chief.

Levels of Process Hazard Analysis

1. **Low Hazard Review (LHR):** Low Hazard Review (LHR) is conducted when the hazard is deemed "low". Low hazard is defined as having little potential to create injury or property damage, and no potential for environmental release. A LHR requires completion of a brief description of the process, the potential hazards, and what steps will be taken to mitigate those hazards. A set of operating procedures, the personal protective equipment required, special training required, and the signature of those involved with the review must be included. The Laboratory Manager and users conduct this level of review. The review is performed using GSFC Form 23-56.

2. **Moderate Hazard Review (MHR):** Moderate Hazard Review (MHR) is conducted when the hazards involved are deemed "moderate". Moderate hazard is defined as having the potential to cause injury, equipment damage, or environmental release. Laboratory Managers and users conduct an MHR. The involvement of a safety representative can be requested and is encouraged. A MHR requires the completion of a comprehensive checklist, and must be accompanied by a complete set of standard operating procedures. Among the information evaluated are process technology, potential hazards and mitigation, environmental issues, and adherence to specific engineering/design standards. The review is performed using GSFC Form 23-57.

3. **High Hazard Review (HHR):** High Hazard Review (HHR) is conducted for experiments, equipment installations, or processes which are deemed "high hazard". High Hazard is defined as having the potential to cause serious injury, severe equipment or facility damage, or negative environmental impact.

   A HHR Committee shall be established for each Laboratory that meets the criteria for High Hazard Review. The HHR Committee will consist of a chairperson, a representative from the Safety and Environmental Branch,

researcher, technician, member of the Chemical Safety Committee (CSC), and any other resources deemed necessary. A comprehensive review by the HHR Committee of all potential hazards involved in processes and equipment is required. A member of the CSC or an S&EB representative can help determine what type of HHR method will be used based on the nature of the hazard(s) presented. The HHR requires that a number of documents be assembled and made available to the review committee. Piping and instrument diagrams, chemical reaction characteristics, relevant incident reports, process chemistry, and operation procedures are all required.

The review is performed using GSFC Form 23-58 and must be documented completely. The HHR Committee must approve significant changes.

Required Participation for Process Hazard Analysis

Position	LHR	MHR	HHR
Laboratory Manager and users	X	X	X
Branch Head	X	X	X
Safety Representative			X
Additional Technical Sources			X

Documentation Requirements

- The Hazard Analysis Selection matrix, a copy of the most recent Hazard Review, and operating procedures/attachments must be available in a prominent location in the laboratory while the work is going on.
- A dated copy of all safety documentation packages, including hazard reviews, Hazard Analysis Selection Matrices, and operating procedures, shall be sent to the Safety and Environmental Branch, Code 205.2.

Hazard Analysis Selection Matrix

For new, modified or relocated processes, equipment or experiments, or scale-up of previous work, characterize your process according to the criteria below. Then use the most detailed analysis method called for by any single criterion.

	No Review Required	LHR*	MHR*	HHR*
1. Material Hazard – Acute Toxicity				
HMIS Health Rating: circle the Hazardous Material Identification System rating, found in the Material Safety Data Sheet (MSDS)	0	1-2	3	4
Cylinder DOT Label: if a cylinder, circle Yes if the DOT label on the cylinder indicates Poison Gas, Corrosive Gas, or Flammable Gas			Yes	
2. Material Hazard – Chronic Toxicity. Circle Yes if the MSDS indicates the material exhibits Chronic Toxicity.			**Yes**	
3. Material Hazard – Flammability. Choose applicable line and circle the MHIS rating from the MSDS				
<1 Liter & MHIS Flammability Rating	0-1	2-4		
>1 Liter & MHIS Flammability Rating	0	1-2	3-4	
≥ Liter and under Pressure or above Flash Point & MHIS Flammability Rating	0		1	2-4
4. Material Hazard – Reactivity. Circle one.				
HMIS Reactivity Rating from MSDS	0-1	2	3-4	
5. Processing Hazard – Radiation. Circle all that apply.				
Laser		Class I-IIIA	Class IIIB– IV	
X-Ray Source		<20kv	>20kv	
Radioisotopes in use	None		Yes	
UV, Infra-red, Microwave, Radio wave		<TLV	>TLV	
6. Processing Hazard – Pressure. Circle any one that applies.				
Non-glass	= 0 psig	<0 psig or >0 psig & <90 psig	>90 psig	
Glassware			<0 or >0 psig	
7. Processing Hazard – Chemical Reaction Energy				
Will adiabatic reaction lead to temperature change? Circle the one that applies. (Check MSDS).	<60° F		>60° F	
Will this cause solvent to boil? Circle yes, if applicable.			Yes	
8. Processing Hazard – New Technology				
New chemistry or technology. Circle correct answer, if applicable.	None		Outside of Experience	Unknown Reactions
9. Equipment Hazard – Electrical. Circle one if applicable.	Protected <120V	Exposed or >120V		
10. Equipment Hazard – Mechanical. Circle yes or no.				
Exposed pinch points, belts, chains, rotating parts, knives, suspended loads, stored energy, etc.	No	Yes		
11. Equipment Hazard – Thermal. Circle one if applicable.				
Unprotected heated or chilled surfaces	> -20° F & < 140° F	< -20° F & >140° F		
12. Environmental Hazards.				
Noise. Circle one. Call x6-6669 if you need assistance.	<80 dBA	>80 dBA		
Hood/Ventilation Testing. Circle one if applicable.		Exemption	Permit	

Contact the Safety and Environmental Branch for assistance if ratings are not available, or if any other assistance is needed in completing the matrix for the forms.

*ACRONYMS

DBA	decibels, A-scale	LHR	Low Hazard Review
DOT	Department of Transportation	MHR	Moderate Hazard Review
HHR	High Hazard Review	OT	Odor Threshold
HMIS	Hazardous Material Identification System	TLV	Threshold Limit Value

Branch Head Date

Laboratory Manager Date